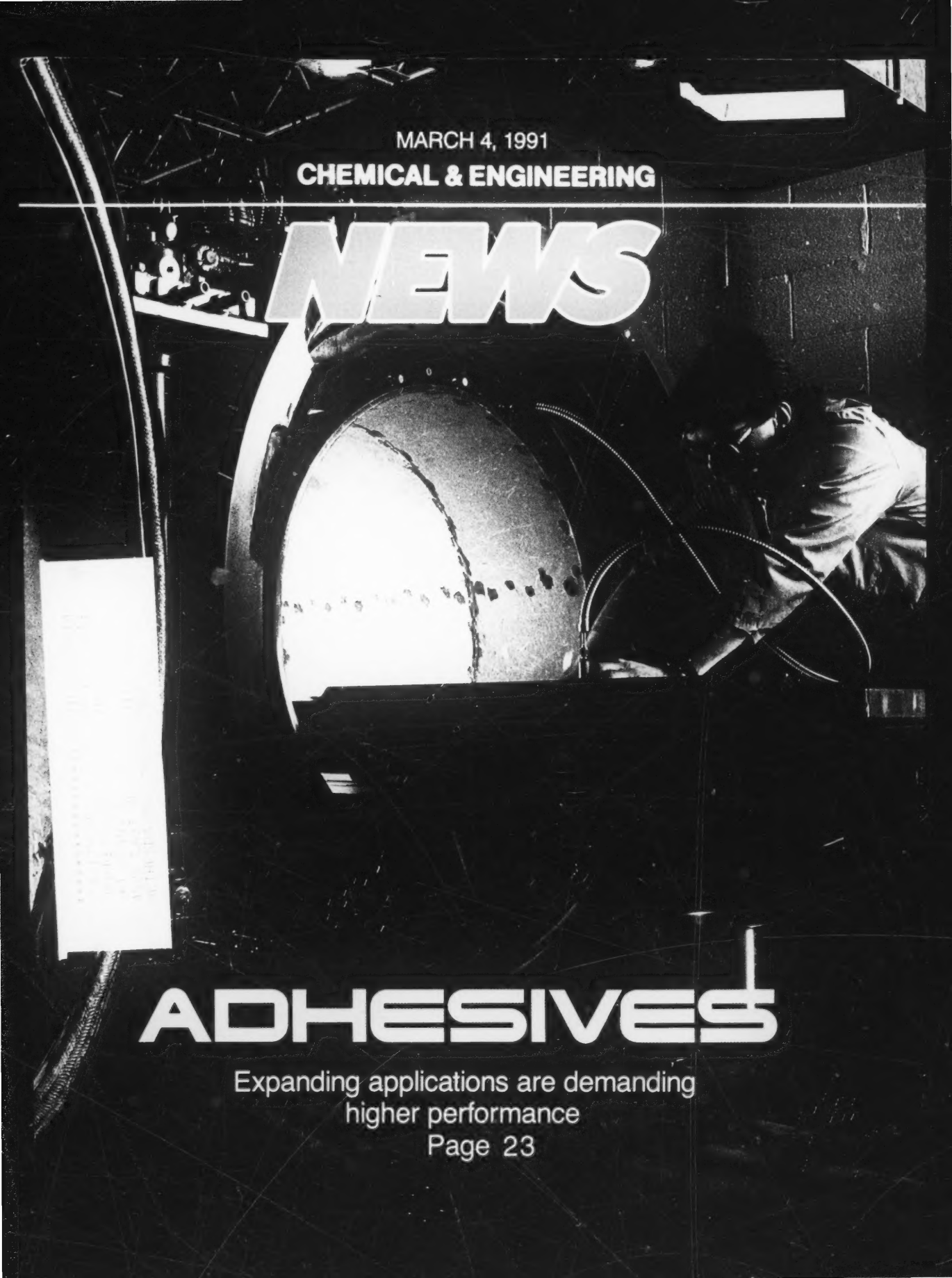
MARCH 4, 1991
CHEMICAL & ENGINEERING

NEWS



ADHESIVES

Expanding applications are demanding higher performance

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CHEMICAL & ENGINEERING NEWS

Volume 69, Number 9
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MARCH 4, 1991

News of the Week

■ **International agreement adopted to enhance detectability of plastic explosives; Congressional report criticizes federal R&D efforts aimed at detecting explosives.** Page 4

■ **Chemical, biological arms issues likely to remain on U.S. agenda despite cease-fire in Gulf war.** Page 5

■ **Pharmaceutical Manufacturers Association pushes for laws boosting incentives for developing orphan drugs.** Page 5

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Western drug companies may get a foothold in the Japanese market as the result of organizational restructuring in the country. **Page 13**

Government

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Cover: American Cyanamid researcher tests adhesive in high-temperature, high-pressure autoclave at company's structural adhesives manufacturing facility at Havre de Grace, Md.

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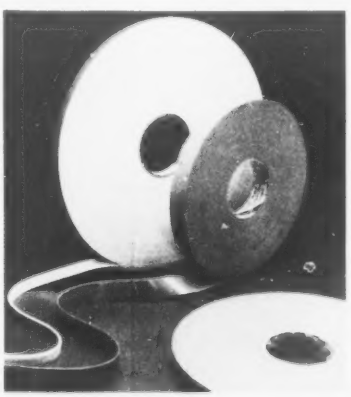

Product Report

U.S. adhesives manufacturers are working feverishly to develop adhesives with higher performance characteristics to meet demands of high-tech applications. **Page 23**

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LETTERS

Beyond uranium

The article "Beyond Uranium" by George Kauffman (C&EN, Nov. 19, 1990, page 18) is a most fascinating and informative document. The names of the researchers read like a litany of patron saints in this esoteric field and should be considered an essential component of any textbook dealing with this subject. Too often, we teach the fundamentals of science without taking time to credit the genius and humanity of those who spend a lifetime unraveling the magnificent mysteries of nature.

This letter was prompted by a small reference on page 22 of the above article to a Michael Cefola, who was a member of the team that isolated the first visible quantity of pure plutonium fluoride back in 1942 at the University of Chicago. Some 35 years ago, I was fortunate enough to do graduate work under professor Cefola at Fordham University. He was a superb teacher as well as a warm, modest person who was most highly respected and loved by his students and colleagues. It took too many years for me to realize just how fortunate I was to have studied under one such as he, inasmuch as his unassuming nature never once alluded to his microanalytical contributions to the historic Manhattan Project.

Peter C. Szap
Department of Chemistry
Georgian Court College

Universities in Hong Kong

With reference to the article "Hong Kong Suffers Brain Drain As It Prepares To Rejoin China" (C&EN, Oct. 22, 1990, page 21), I would like to make the following clarification with regard to the higher education scene in Hong Kong.

Currently, there are six institutions financially supported by the Hong Kong government via the University and Polytechnic Grants Committee as follows: the University of Hong Kong, Chinese University of Hong Kong, the newly established Hong Kong University of Science & Technology, Hong Kong Baptist College, Hong Kong Polytechnic, and City Polytechnic of Hong Kong. They are essentially all supported by government funds and thus are not private universities as described in the article.

Moreover, all six institutions offer undergraduate degree programs and thus the undergraduate training is not, as described, confined to the two polytechnics. As a matter of fact, Hong Kong Polytechnic in the past offered courses only for the award of higher certificates and diplomas with emphasis on the training of skilled technicians. However, they have offered both degree and diploma courses over the past eight years, and emphasis has shifted to offering courses leading to the award of degrees.

Hong Kong University is the oldest university in Hong Kong and stress has been placed on research and postgraduate training. However, research is an important element for any tertiary institution, and all the other institutions also make notable contributions to research and postgraduate training in Hong Kong.

Y. S. Fung
Vice Chairman
Hong Kong Chemical Society

Benefits of pesticides

I wonder if other chemist readers reacted to the review of a book that appeared under the heading "Third World Agricultural Tragedies" (C&EN, Dec. 17, 1990, page 32) as I did. The book and the review seem to fit a pattern of knocking the benefits of science and stressing costs over benefits that recent ACS leaders have blamed, at least in part, on poor science education in American schools. Others would see it as an expression of a back-to-nature bias of an affluent society.

I suppose it's sporting to expose readers of C&EN to some of the negative effects of the use of chemicals, and few deny that there have been negative effects. It does seem a bit incongruous, though, to read such a one-sided attack on the products of the creative activities of ACS members in the ACS news magazine without that magazine's making some effort to present the benefit side of the equation in equally enthusiastic terms.

There are many of us who work in the agrochemical field who feel that what we are doing is extraordinarily worthwhile. The combination of new crop varieties, fertilization, and agrochemicals has prevented the mass starvation that

Correction

• Feb. 25, page 28: The caption for the angiogram photos should read: Angiograms showing blood flow in blocked coronary arteries (right) indicate improvement after treatment (left) with TPA.

Italy's Chemical Industry Looks To Expand Beyond Country's Borders

Although dynamic and growing, industry is highly fragmented, will turn to mergers and joint ventures in drive toward globalization

Patricia L. Layman, C&EN London

The Italian chemical industry is, by the calculations of CEFIC, the European Chemical Industry Council, in a toss-up for third largest chemical industry in Western Europe, vying with the U.K. for that honor (after Germany and France).

Historically, cynical observers have asked, "Is it for real?" And yet, the joke has only been made by the chemical industries in other countries, both in and outside Western Europe. Despite fragmentation and lack of renown outside Italy, the industry remains dynamic and growing—even though this year probably will see a slight slowdown in growth from 1989 and 1990.

Sales of the Italian chemical industry in 1990 were roughly $54.5 billion, an increase of 1.6% in real terms over those of 1989, accounted for by more than 1200 producers and marketers of chemicals, plastics, specialties, pharmaceuticals, and a variety of allied products. However, much like the comparable industries of other Western European countries, its production and sales are dominated by only a few giants, with several tiers following them.

At the top of the list has been Enimont, the ill-starred joint venture between ENI, the Italian state-owned energy company, and privately held Montedison. The venture was put together in January 1989; after floundering about with no cohesive strategy—or no cohesive political will to put a strategy into effect—the venture was wound up in January 1991, after two years of what essentially was wasted time. Montedison's share was sold to ENI, which now runs the operations under the name EniChem.

During the life of the venture, Enimont chalked up sales of $13.6 billion in 1989 and probably even higher in 1990, although no figures have been released yet. Whatever the sales are, however, they will dwarf those of the next largest Italian chemical company, Montedison, in turn renamed Montecatini at the beginning of this year. Montedison's sales in 1989 were $5.19 billion; even lumping in sales of its subsidiary, Himont, that would bring the 1989 total to only $5.88 billion. The third largest is Italian holding company Snia BDP with interests in synthetic fibers and explosives, among other things, and 1989 sales of $2.17 billion.

Below Snia is another tier of companies made up of the Italian subsidiaries of multinationals, such as Dow Chemical, Solvay, Procter & Gamble, and 3M. Not until the pharmaceutical company Bracco Industria Chimica, with sales of $441 million in 1989, does another Italian-headquartered chemical producer appear on the roster.

The host of small to medium-sized companies making up the chemical industry in Italy has, in fact, led Roberto Sestini, vice president of the Italian chemical manufacturers' federation, Federchimica, to refer to its "pulverization."

These companies account for a significant proportion of the activity in the specialized sectors of the Italian chemical industry, which last year was 32% of total production. Fine chemicals accounted for 26%, and basic chemicals the remaining 42%.

The other side of the coin, however, shows that in 1990, specialty chemicals accounted for 43% of the Italian chemical trade deficit, fine chemicals 20%, and basic chemicals 37%. In 1987, those figures were nearly reversed: Specialties accounted for 39% of the chemical trade deficit, fine chemicals 18%, and basic chemicals 43%. The trend underlines the increasing importance of specialty, higher value-added chemicals to the Italian industry—but also the weakness of smaller companies, with their more limited financing, marketing, and production facilities, to compete effectively in an international arena.

However, Sestini believes the fragmentation of the industry is both a strength and a weakness.

The president of Italian industrial gases producer Societa Italianà Acetilene e Derivati (SIAD), in Bergamo, Sestini cites his own industrial gas industry as an example. "Small companies can survive very well. They

Sestini: fragmentation is both a strength and a weakness

are working in a small area, but they can have low costs." However, the disadvantage comes when an industry is turning to new technology and the smaller companies have limited or no access to new markets.

Over the next five years, he suggests, smaller companies will agglomerate, or be acquired. There will be less and less room in the marketplace for the small company that, by taking no positive action, remains small.

Smaller companies might merge—or they might form alliances with larger operations, Sestini adds. SIAD provides a case in point. In 1989, it formed a venture with Union Carbide and EniChem to work with molecular sieves for oxygen separation and membranes for nitrogen separation. Union Carbide provides the technology on molecular sieves, and EniChem, production capacity; the Italian company contributes its knowledge of domestic markets and marketing.

Ventures to reinforce work in research and development can also lead to joint ventures and alliances, says Adriano Teso, chairman of coatings company IVM SpA., based in Milan. IVM has specialized in the wood finishes sector. "It is necessary to concentrate, to have critical mass for production of resins, for R&D, and so on," says Teso, whose company, or its forerunners, have focused on wood varnishes and specialty polymer coatings since after World War II.

"Critical mass is very important to get the right developments. Even ICI, for example, is only in four or five coatings sectors, as is PPG. They are not in all of them. Because we started little, to have good results, we have had to concentrate on one sector," Teso adds.

Venturini: big changes in next decade

Teso argues that fragmentation in the industries his company serves has, in turn, provided benefits to IVM and other Italian chemical producers. "As an Italian company, we've had a little advantage: The Italian furniture industry is very developed, with production systems very different and very complex. To be in this market, to work in this market, we had to produce a lot of systems. The market forced us to become very competitive."

In Western Europe, points out SIAD's Sestini, "there is only one country—Italy—where small or medium-sized industries are still private. In the other countries, the multinational companies are present," as strong manufacturing sources rather than merely as commercial sellers of goods. "It is very difficult for an Italian company to buy a company outside Italy. It is much easier for the multinational to buy the Italian private company."

With that potential threat concentrating the minds of the Italian industry, companies are looking at how to grow and expand beyond the country's borders, but the process is difficult and slow for small companies, compared with the industrial giants, requiring patience and persistence. SIAD, Sestini points out, is "now looking outside Italy, also." It could have tried expanding on the strength of the venture with Union Carbide and EniChem—everyone knows Union Carbide, he points out. However, it opted instead to tackle the challenge alone: "We decided about two years ago to go outside Italy with SIAD. We opened a SIAD branch company in Austria, and this year will start a joint venture in Yugoslavia." And it has a commercial office in Bucharest to keep tabs on opportunities opening in Eastern Europe.

It is a limited and specific goal, says Sestini: "We want to be 'global in Europe.' "

To accomplish that kind of goal, it is increasingly clear that small to medium-sized chemical companies in Italy will turn to joint ventures and alliances. That's the same route, ironically, that the Italian giants have taken, as they drive toward globalization.

EniChem, for example, has been particularly active over the past four or five years in setting up joint ventures both in Western Europe and, more important, in Eastern Europe and the Far East. And Montecatini officials have indicated that, rather than grand acquisitions, it will look for alliances and joint ventures to help it grow through the coming decade, strengthening its geographical and product coverage.

As Guido Venturini, director general of Federchimica, sees it, the next decade will be particularly important for the Italian chemical industry as it grows and copes with a revolution in how the industry does business. There will be new technologies—biotechnology, new materials, new R&D projects, and so on; continued production automatization; and new marketing technologies, as well as a growing environmental imperative.

"It is a must," he says. "The Italian chemical industry of 10 years from now will be different than today. It is not only a question of economics, capital, and so on—the sector itself will be changing. And because of the dynamic approach to capture survival, such actions as takeovers, or creating new company groups, will be just one of the angles." □

Italian chemical industry growth will slow this year

$ Billions	1991[a]	1990[b]	% change[b] 1990-91	1989-90
Sales	$58.850	$54.513	1.2%	1.6%
Imports	24.779	23.186	2.0	5.0
Exports	14.867	13.894	2.0	3.0
Net consumption	68.761	62.920	1.2	2.6

Note: $1.00 = 1130 lire. a Estimated. b Corrected for inflation.
Source: Federchimica

U.S. chemical industry backs free trade with Mexico

Earl V. Anderson,
C&EN Northeast News Bureau

There's no shortage of opposition to the proposed free trade agreement between the U.S. and Mexico, from many in Congress, labor, and agriculture. The chemical industry, however, is solidly behind the idea.

Testifying at hearings held recently by the House Ways & Means Committee's trade subcommittee, Dexter F. Baker, chairman and chief executive officer of Air Products & Chemicals, said the chemical industry supports the idea of negotiating a free trade agreement with Mexico. And, he adds, it also believes that if Canada participates in the trade talks as planned, the negotiations could lay the foundation for a true North America Free Trade Agreement. Until recently, such an agreement—or NAFTA as it has been called—has been little more than a dream.

Baker testified on behalf of the Chemical Manufacturers Association, which represents 90% of the U.S. capacity for making basic industrial chemicals. Although he is also head of the Office of the Chemical Industry Trade Adviser, a group of several chemical industry trade associations, including CMA, he did not wear that hat when he testified.

This does not mean that the U.S. chemical industry is divided on the Mexico free trade issue, says Baker. It was just a matter of timing. Other members of OCITA simply did not hold their meetings in time to endorse the policy that he outlined before the trade subcommittee. But he expects other OCITA members to climb aboard, as they have on most other trade issues.

Certainly the chemical industry has reason to give the proposed free trade talks a high priority. Although U.S. chemical trade with Mexico pales beside trade with Canada, Japan, or the European Community, it is nevertheless large—and growing. U.S. chemical exports to Mexico last year were valued at $2.3 billion, about 6% of the total. But that value is virtually double what it was in 1986. Chemical imports from Mexico, however, are small by comparison. Mexico shipped the U.S. $665 million worth of chemicals last year. That's only 3% of total U.S. chemical imports, but it represents an 80% increase over that in 1986.

Baker is encouraged by recent developments in Mexico. He gives high marks to the fact that Mexico even wants a bilateral trade agreement with the U.S. Former Mexican President Miguel De La Madrid Hurtado started many economic reforms in his country, reforms that the current President, Carlos Salinas De Gortari, is continuing.

Salinas has recently liberalized laws governing technology transfer, investments, and imports. As a relatively new member of the General Agreement on Tariffs & Trade (GATT), Mexico has "bound" its tariff rates far below those of other developing countries.

As a result, Baker believes that chemical trade between the two countries can flourish under a free trade agreement. However, the U.S. chemical industry has its own ideas about what should come out of the trade negotiations. Its general objectives are to ensure market access in Mexico for U.S. chemical producers, the right to freely invest in Mexico, and the opportunity to harmonize Mexican and U.S. "trade remedy" laws. These are the laws, such as antidumping laws, that provide relief to an industry or company hurt by imports.

Baker: encouraged by developments

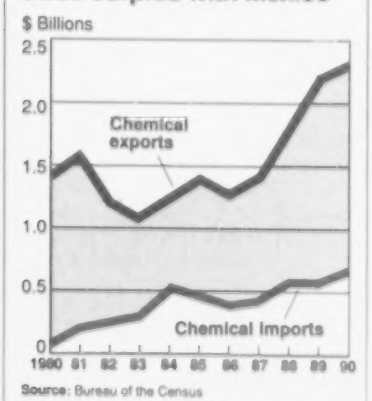
According to Baker, the negotiations should tackle some of the current Mexican practices that he says distort the U.S. chemical trade with that country. For instance, he wants to see Mexico eliminate its dual-pricing procedures, by which, among other things, Pemex gives domestic customers a lower price than customers in the export market. Pemex is the state-owned petroleum company (Petroleos Mexicanos) that by law is the sole producer of primary petrochemicals in Mexico.

Mexico already has taken some giant steps to liberalize foreign investment laws in the petrochemical sector. Now, only 86 chemicals require some form of Mexican government participation, while only 20 primary petrochemicals are completely reserved for Pemex (Mexico eliminated many products from its list of "primary" petrochemicals).

That's progress, but Baker wants to see Mexican foreign investment rules eased further for petrochemicals. The negotiations, he says, should focus on the trade impact of policies that reserve portions of some industries for the government.

Baker also thinks that negotiators should try to harmonize the two countries' trade remedy laws. At the very least, he says, these laws should

U.S. has huge chemical trade surplus with Mexico



Source: Bureau of the Census

Most U.S. chemical trade with Mexico is in basic chemicals

$ Millions	1990 Exports	1990 Imports	1990 Trade balance	1989 Exports	1989 Imports	1989 Trade balance	1988 Exports	1988 Imports	1988 Trade balance
Organics	$ 603	$157	$ 446	$ 691	$158	$ 533	$ 660	$114	$ 546
Inorganics	224	236	−12	206	204	2	169	194	−25
Dyeing, tanning & coloring materials	99	39	60	69	33	36	51	40	11
Medicinals & pharmaceuticals	106	15	91	74	17	57	74	23	51
Essential oils, perfumes, toiletries, polishing & cleansing materials	131	44	87	88	39	49	39	40	−1
Fertilizers	44	15	29	57	10	47	28	3	25
Plastics in primary form	537	31	506	545	35	510	629	158	471
Plastics in nonprimary form	326	76	250	284	59	225	a	a	a
Miscellaneous	254	52	202	210	28	182	180	23	157
TOTAL	$2325	$665	$1660	$2225	$582	$1643	$1830	$595	$1235

Note: Totals may not add due to rounding. a Prior to 1989 the Bureau of the Census did not use the classification "plastics in nonprimary form." **Source:** Bureau of the Census

provide for national treatment and guarantee due process for all parties in both the U.S. and Mexico.

Any free trade agreement between the U.S. and Mexico also should contain a workable dispute-settlement mechanism, Baker told the Congressional subcommittee. He suggests that it be modeled after the dispute-settlement procedures contained in the Canada-U.S. free trade agreement.

But for the U.S. chemical industry, one of the major goals of the trade talks with Mexico, as it has been in the stalled Uruguay round of multilateral trade talks in Geneva, is "market access." By definition, market access has come to encompass both tariffs and nontariff barriers.

What the U.S. chemical industry wants in a trade agreement with Mexico is "market access without unreasonable barriers," says Baker. The agreement should provide each country with improved and equivalent access to the other country's markets, including petrochemicals. To achieve this, both tariffs and nontariff barriers must be progressively eliminated, he says. Baker stresses that tariffs should be reduced and eliminated in stages over a five or 10-year period. Tariffs on some products, he adds, could be eliminated immediately through an acceleration process if producers in both countries agree. This is what has already happened for many chemicals under the Canada-U.S. free trade agreement.

But Baker hopes that negotiators can avoid one pitfall contained in the Canada-U.S. agreement. Under that pact, any producer can block a proposal to accelerate a tariff cut, regardless of how small an interest that producer has in the product. Baker believes that a company should at least be competitive in its own market before it can enjoy the right to block a proposed acceleration in tariff cuts that the major producers favor.

But nontariff barriers, as well as tariffs, also are on the chemical industry's list of concerns. One in particular is a rule of origin. The industry wants negotiators to come up with a rule of origin by which most of the benefits of a Mexico-U.S. agreement would go to the nationals of those countries. The idea is to prevent a third party from, say, shipping its product into Mexico, doing a token amount of work on the product, then shipping it into the U.S. with the benefit of low—or no—tariffs.

Baker says a trade pact should require that any product imported into Mexico or the U.S. be "substantially" transformed before it could be considered as a product of that country and eligible to be exported to the other under preferential tariff rates. There are some problems with the rule of origin written into the Canada-U.S. agreement, Baker notes, and the Mexican and U.S. negotiators should take that experience into account.

Domestic technical standards are another possible problem that the chemical industry wants negotiators to consider. These, says Baker, could hinder free trade by unfairly excluding products of foreign countries. To make sure that technical standards do not become a significant trade barrier, Baker says there should be some mechanism established to monitor and harmonize U.S. and Mexican standards.

And, although Mexico has come a long way in improving its laws protecting intellectual property, the U.S. chemical industry believes more can be done. Mexican law, for instance, does not extend patent protection to fine chemicals or pharmaceuticals.

Opponents of the proposed Mexico-U.S. trade pact, including many in Congress, fear that some U.S. companies will move their plants to Mexico to avoid high labor costs, or the high costs of complying with U.S. environmental regulations, or both. Baker assured the committee that this would not be the case in the chemical industry.

First, the industry is capital-intensive; labor costs are not a major factor. And environmental issues won't be a factor, either. Mexico already is stiffening its environmental protection laws. And, points out Baker, U.S. chemical companies build their foreign plants to meet the most stringent environmental standards. □